Consequences of selection for indirect genetic effects on growth for production traits in pigs

Irene Camerlink, N. Duijvesteijn, J.E. Bolhuis, J.A.M van Arendonk and P. Bijma

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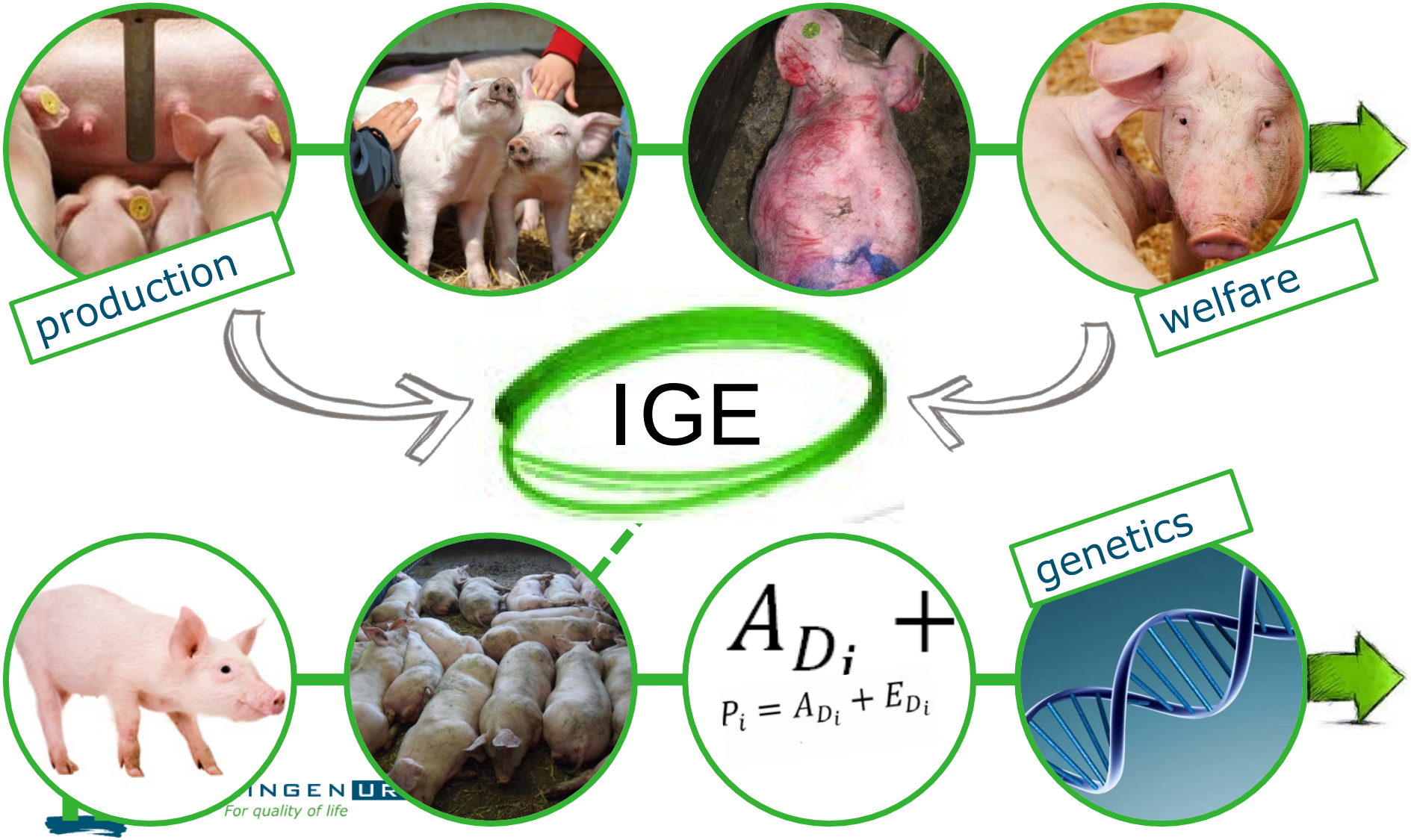
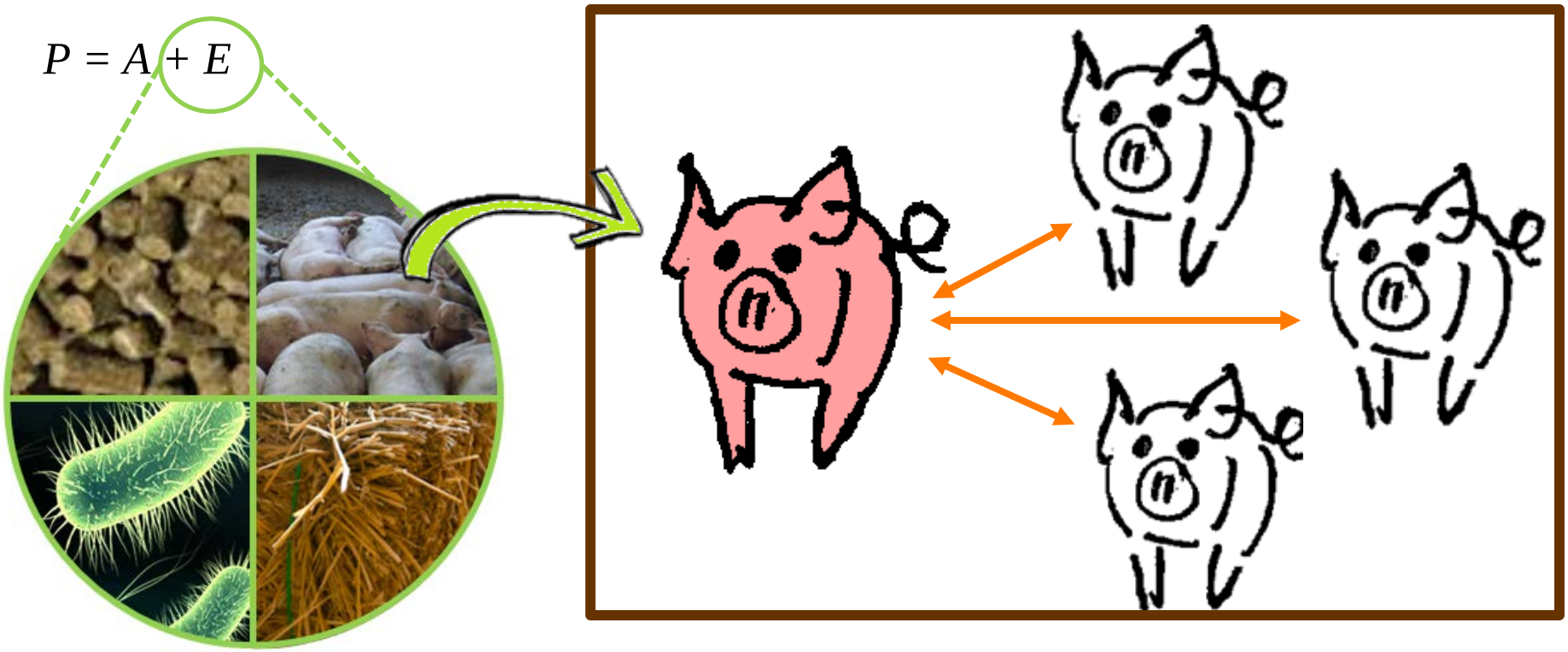
Long term challenges



Indirect Genetic Effects (IGE)

Indirect Genetic Effect (IGE)[1] = heritable effect of an individual on its social partners

Pigs: heritable effect on the growth of pen mates



[1] Social genetic effect, associative effect, competitive effect, Social Breeding Value

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PLOS ONE

Indirect Genetic Effects and Housing Conditions in Relation to Aggressive Behaviour in Pigs

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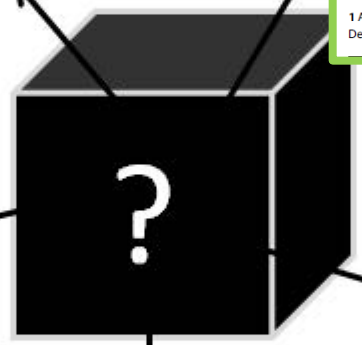

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The pig's nose and its role in dc harmful behaviour

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Relationship between growth rate and oral manipulati nosing, and aggression in finishing pigs

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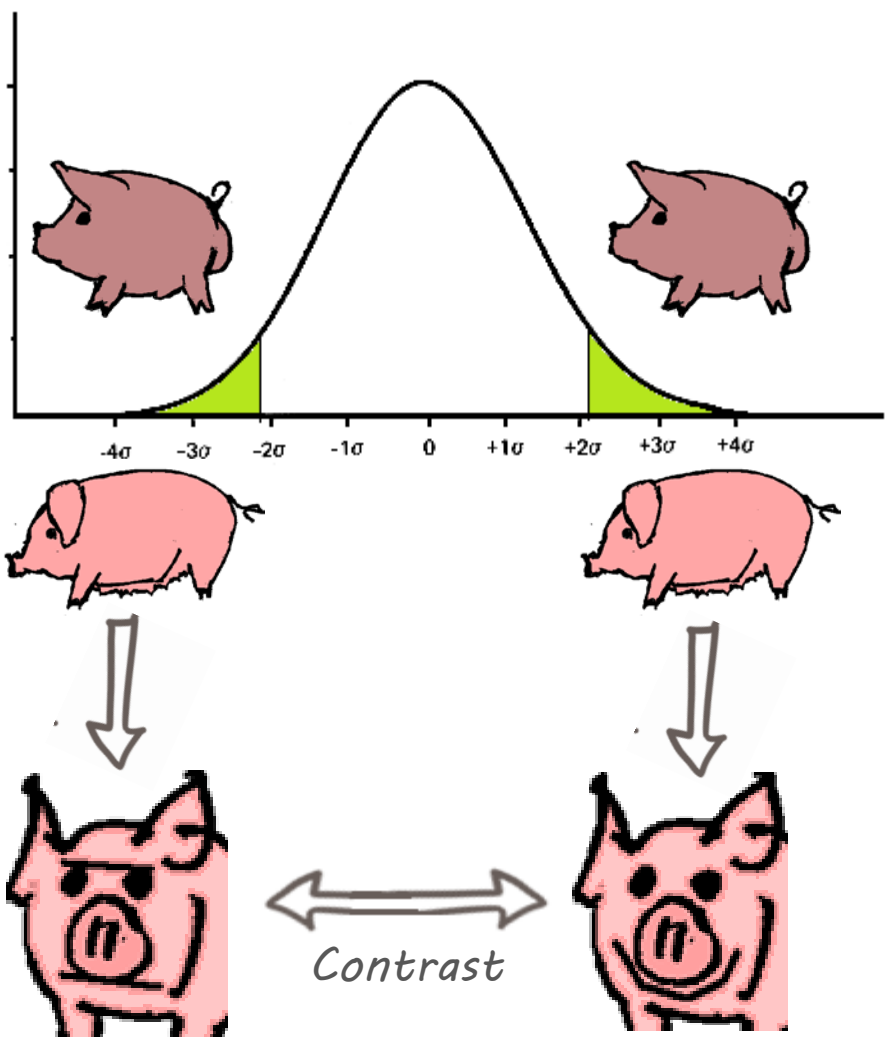
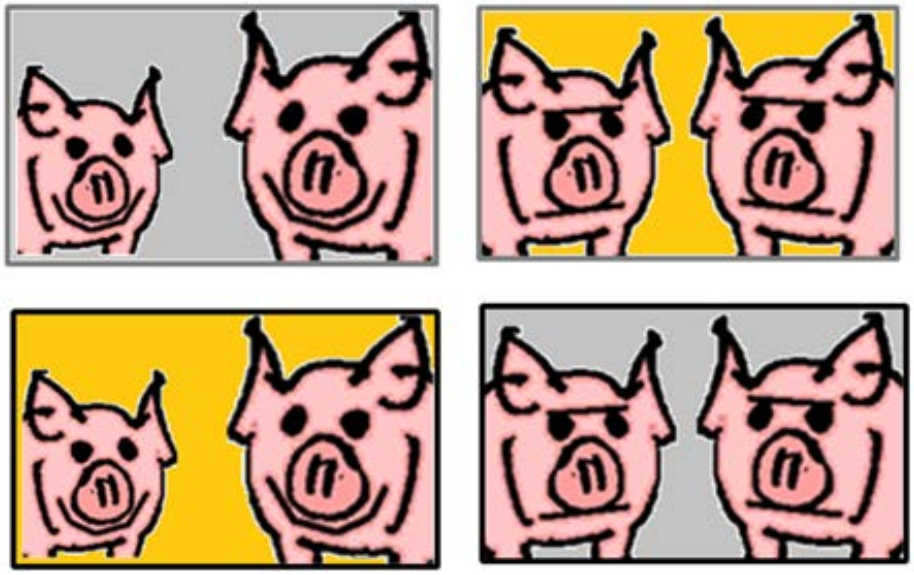
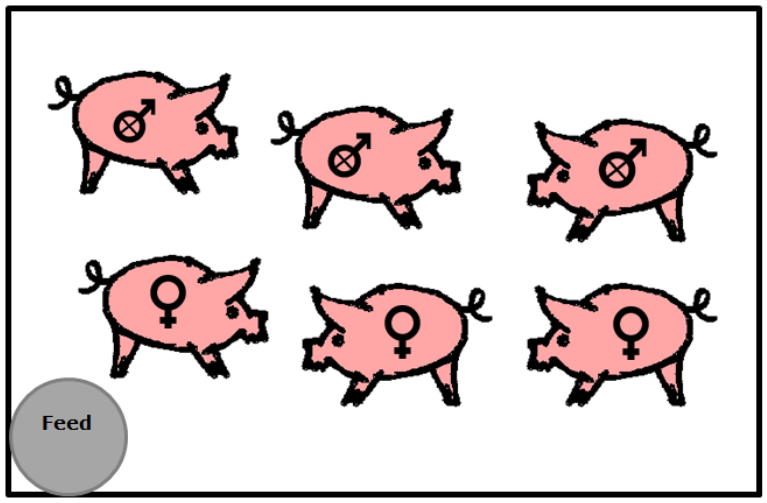
One-generation selection experiment



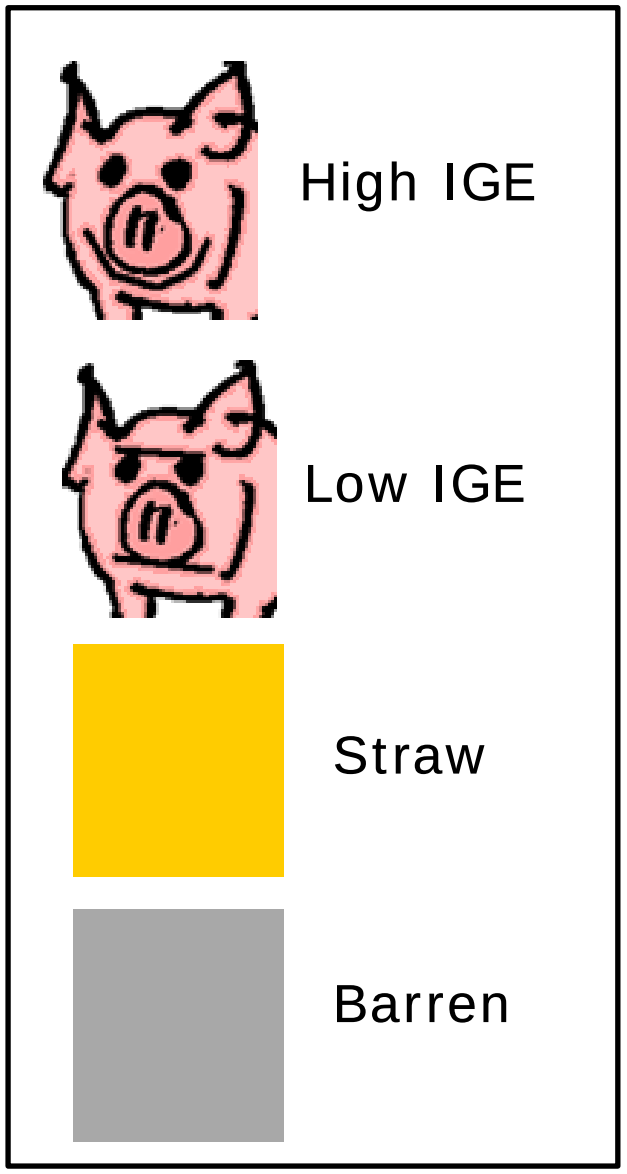
- IGE for ADG finishing
- based on pedigree
- high / low selection
- A priori estimated IGE contrast **3.6 g ADG** (DBV contr. 3.1)
- Re-estimated (excl. trial) contrast **2.8 g ADG** (DBV contr. 0.1)

G×E set-up

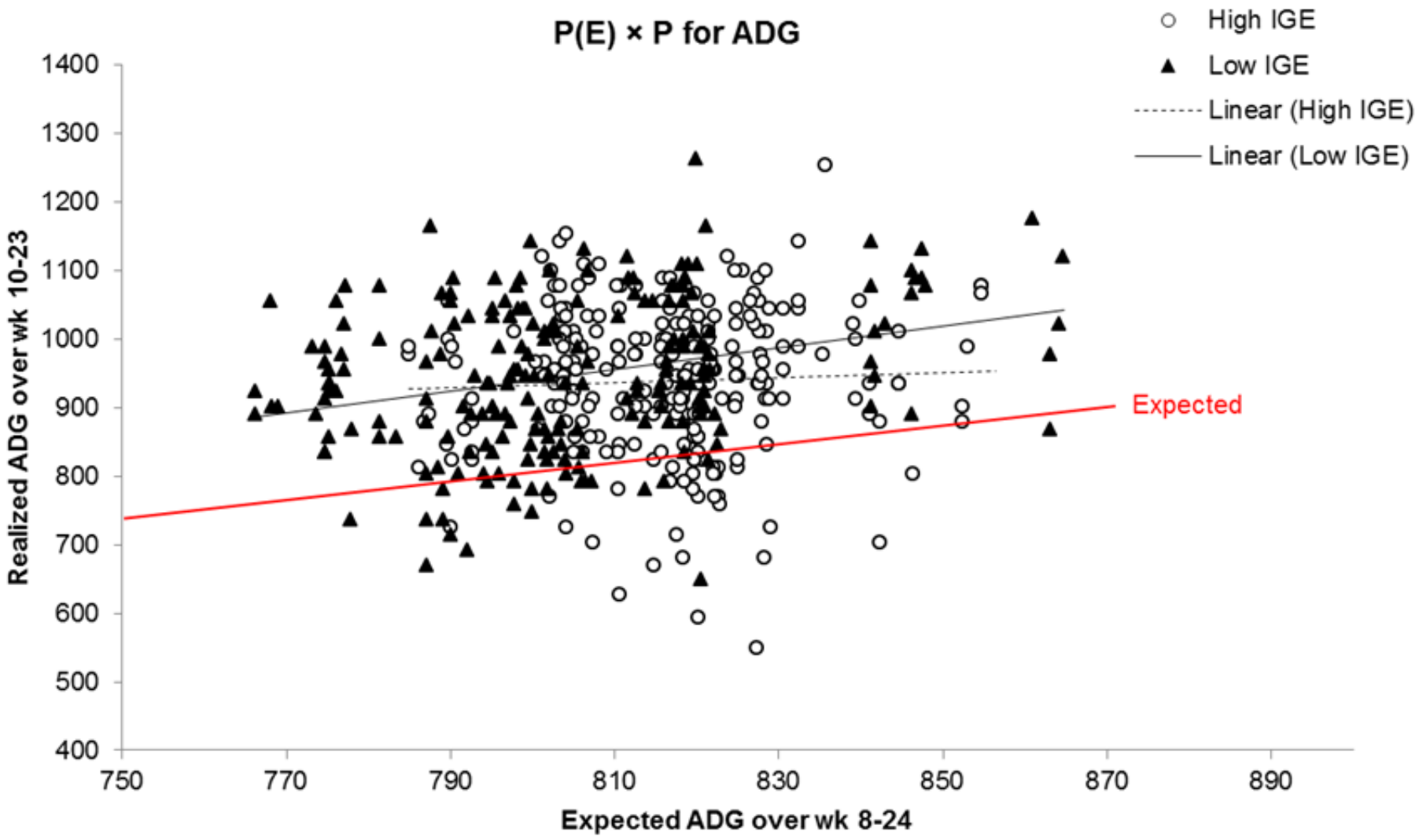




x 80



Results – no difference in ADG w10-23



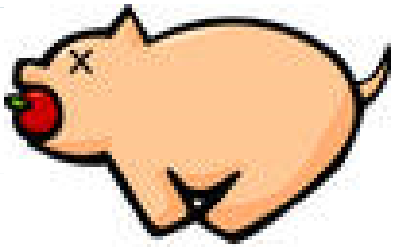
Results – BW in opposite direction

- High IGE lower body weight after weaning

Age (wk)	High IGE	Low IGE	SE	P-value
5	8.9	9.2	0.1	0.004
10	33.1	34.1	0.3	0.01
17	84	86	0.6	0.08
23	118	121	0.9	0.07

- No difference feed intake
- No difference feed conversion ratio (FCR)

Results slaughter



Measurement	High IGE	Low IGE	*P*-value
Carcass weight (kg)	92.0 ± 0.8	94.6 ± 0.8	0.02
Back fat thickness (mm)	18.1 ± 0.3	18.5 ± 0.3	0.35
Meat (%)	55.1 ± 0.2	55.1 ± 0.2	0.93
Muscle depth (mm)	58.5 ± 0.5	60.7 ± 0.5	0.0013
Stomach wall damage (1–5)	2.7 ± 0.1	2.5 ± 0.1	0.08

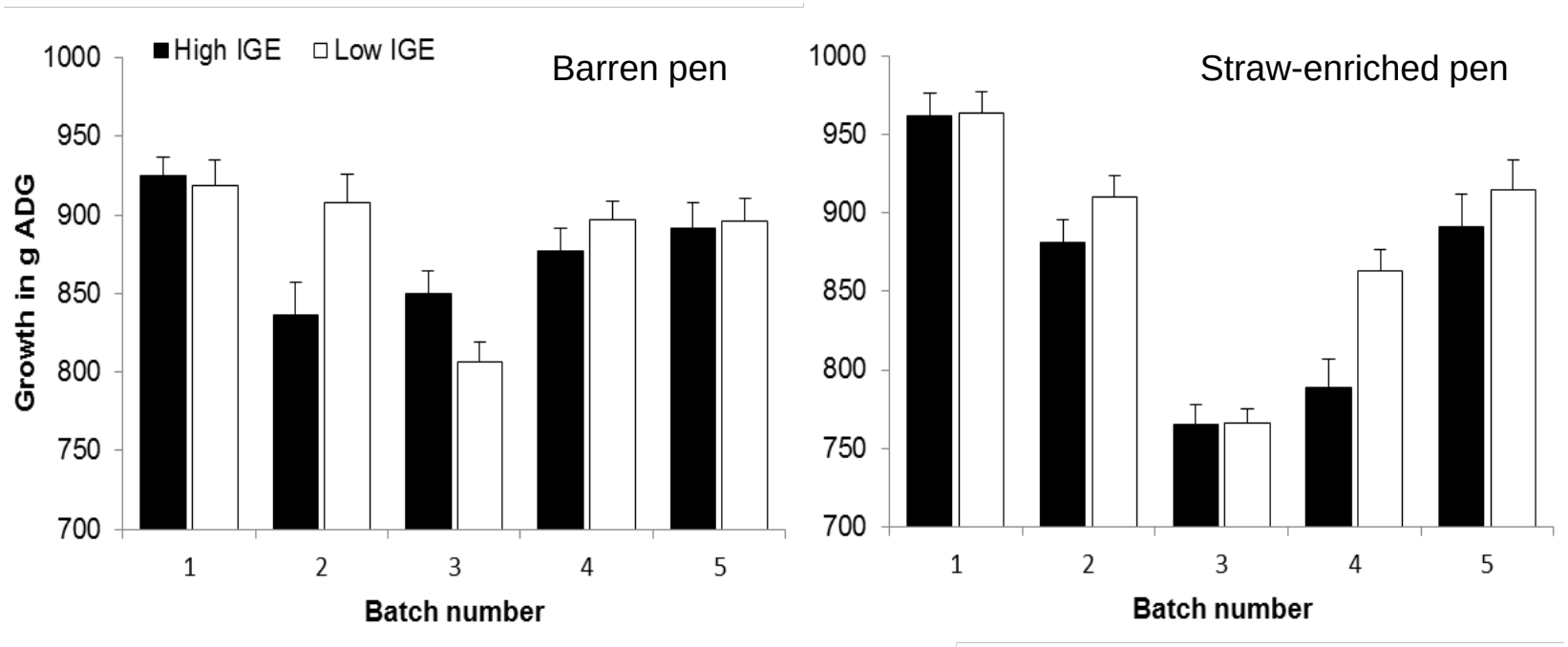
Discussion

Novelty selection method

⇨ Difficulty of selection for IGE on growth in pigs

⇨ Contrast smaller at re-estimation

⇨ One generation of selection



Discussion

Differences found in aggression and tail biting behaviour

⇨ Low IGE more biting behaviour

Differences to commercial practice

⇨ *Ad lib* feeding – less competition

⇨ Strict measures against tail biting

Avoiding ‘damaging’ behaviour in trial limits effect on growth

Long term perspective

Selection on IGE for growth is a long term, but promising challenge to simultaneously improve pig welfare, production, and breeding value estimations

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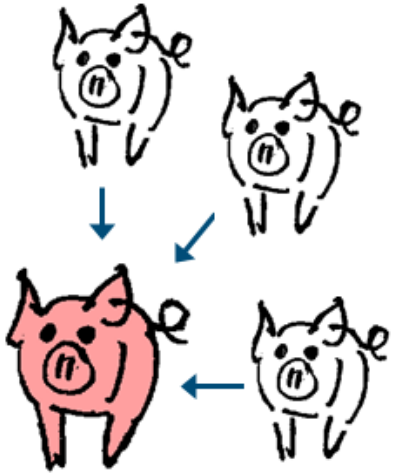
Ministry of Economic Affairs, Agriculture and Innovation

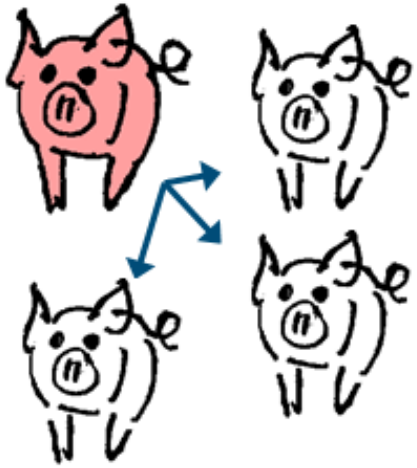
NWO
Netherlands Organisation for Scientific Research

Indirect genetic effects

Indirect Genetic Effects for growth: heritable effect a pig has on the growth of its pen mates



$$P_i = \underbrace{A_{D_i} + E_{D_i}}_{\text{Own genetics}} + \underbrace{\sum_{i \neq j} (A_{S_j} + E_{S_j})}_{\text{Genetics of others}}$$



$$TBV_i = \underbrace{A_{D_i}}_{\text{DBV}} + \underbrace{(n-1)A_{S_i}}_{\text{SBV: effect on others}}$$